CLAIMS

What is claimed is:

1. A process for cementing a subterranean formation, comprising:

(a) forming a cement composition comprising a cement and one or more beads combined with the cement; and

(b) introducing an inert gas phase to the cement composition.

2. The process of claim 1 wherein the cement composition further comprises a mixture of foam and foam stabilizing surfactants.

3. The process of claim 1 wherein step (b) reduces an elastic modulus of the cement composition by from about 5% to about 90%.

4. The process of claim 1 wherein the beads are selected from the group consisting of cenospheres, glass spheres, ceramic spheres, and combinations thereof.

5. The process of claim 1 wherein the cement is a hydraulic cement.

6. The process of claim 1 wherein the introducing the inert gas phase comprises one or more of the following methods:

(i) adding a gas generating material to the cement composition;

(ii) adding a porous material to the cement composition; and

(iii) injecting gas directly into the cement slurry.

7. The process of claim 6, further comprising displacing the cement composition into a well bore in contact with the subterranean formation.

8. The process of claim 7 wherein the gas generating material is a nitrogen generating material, and further comprising introducing an oxidizing agent to the cement composition, the oxidizing agent being capable of activating the nitrogen generating material.

9. The process of claim 8 wherein the oxidizing agent is introduced to the cement composition prior to the displacing the cement composition, and wherein the nitrogen generating material is introduced to the cement composition during the displacing the cement composition such that the oxidizing agent activates the nitrogen generating material, thereby producing gas in the cement composition.

10. The process of claim 8 wherein the nitrogen generating material is introduced to the cement composition prior to the displacing the cement composition, and wherein the oxidizing agent is introduced to the cement composition during the displacing the cement composition such that the oxidizing agent activates the nitrogen generating material, thereby producing gas in the cement composition.

11. The process of claim 8 wherein the nitrogen generating material and the oxidizing agent are concurrently introduced to the cement composition during the displacing the cement composition.

12. The process of claim 8 wherein the nitrogen generating material is selected from the group consisting of hydrazine, hydrazine salt of an acid, azodicarbonamide, azobis(isobutyronitrile), p-toluene sulfonyl hydrazide, p-toluene sulfonyl semicarbazide, p-p'-oxybis(benzenesulfonylhydrazide), carbodihydrazide, and combinations thereof.

13. The process of claim 8 wherein the oxidizing agent is selected from the group consisting of ammonium persulfate, sodium persulfate, potassium persulfate, sodium chlorite, sodium perborate, sodium peroxy carbonate, calcium hypochlorite, sodium hypochlorite, sodium bromite, sodium hypobromite, sodium bromate, sodium chlorate, and combinations thereof.

14. The process of claim 6 wherein the gas generating material is a hydrogen generating material.

15. The process of claim 14 wherein the hydrogen generating material is selected from the group consisting of aluminum, calcium, zinc, magnesium, lithium, sodium, potassium, and combinations thereof.

16. The process of claim 14 wherein the hydrogen generating material is an aluminum powder.

17. The process of claim 6 wherein the porous material comprises openings in which air is disposed.

18. The process of claim 1 wherein the inert gas phase is present in the cement composition in an amount effective to maintain a density of the cement composition in a range of from about 8 to about 23 lb/gal when one or more of the beads break.

19. A cement composition comprising:

a cement;

one or more beads combined with the cement; and

an inert gas phase.

20. The cement composition of claim 19, further comprising a mixture of foam and foam stabilizing surfactants.

21. The cement composition of claim 19 wherein the beads are selected from the group consisting of cenospheres, glass spheres, ceramic spheres, and combinations thereof.

22. The cement composition of claim 19 wherein the cement is a hydraulic cement.

23. The cement composition of claim 19, wherein the cement further comprises and is mixed with:

(i) a gas generating material;

(ii) a porous material; or

(iii) combinations of (i) and (ii).

24. The cement composition of claim 23 wherein the gas generating material is a nitrogen generating material, and further comprising an oxidizing agent mixed with the cement, the oxidizing agent being capable of activating the nitrogen generating material.

25. The cement composition of claim 24 wherein the nitrogen generating material is selected from the group consisting of hydrazine, hydrazine salt of an acid, azodicarbonamide, azobis(isobutyronitrile), p-toluene sulfonyl hydrazide, p-toluene sulfonyl semicarbazide, p-p'-oxybis(benzenesulfonylhydrazide), carbodihydrazide, and combinations thereof.

26. The cement composition of claim 24 wherein the oxidizing agent is selected from the group consisting of ammonium persulfate, sodium persulfate, potassium persulfate, sodium chlorite, sodium perborate, sodium peroxy carbonate, calcium hypochlorite, sodium hypochlorite, sodium bromite, sodium hypobromite, sodium bromate, sodium chlorate, and combinations thereof.

27. The cement composition of claim 19 wherein the gas generating material is a hydrogen generating material.

28. The cement composition of claim 27 wherein the hydrogen generating material is selected from the group consisting of aluminum, calcium, zinc, magnesium, lithium sodium, and potassium, and combinations thereof.

29. The cement composition of claim 27 wherein the hydrogen generating material is an aluminum powder.

30. The cement composition of claim 23 wherein the porous material comprises openings in which air is disposed.

31. The cement composition of claim 19 wherein the inert gas phase is present in the cement composition in an amount effective to maintain the density of the cement composition in a range of from about 8 to about 23 lb/gal when one or more of the beads break